# Submission in Response to NSF CI 2030 Request for Information



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**Research Domain, discipline, and sub-discipline**

Advanced Cyberinfrastructure

**Title of Submission**

Opportunities and Challenges for Regional Research Computing Approaches in the Next Decade: A Perspective from Academic Centers

**Abstract** (maximum ~200 words).

The diversity of university researchers that rely upon advanced cyberinfrastructure is increasing on all campuses. Access to resilient, reliable, and robust computing and data resources is no longer a luxury, but, rather, an expectation for modern research productivity. The pyramid model of cyberinfrastructure (scaling from local PI and campus to leadership facilities at the top) should guide the investments in advanced cyberinfrastructure. The position here represents a view from the middle of the pyramid, R1 institutions and regional collaborations, which should play a larger role in providing user focused access to cyberinfrastructure. Through targeted investment in the middle of the pyramid, NSF can help provide a more diverse and user focused computational and data infrastructure and broaden access by lowering the hurdle moving from the local to leadership facilities.

**Question 1** Research Challenge(s) (maximum ~1200 words): Describe current or emerging science or engineering research challenge(s), providing context in terms of recent research activities and standing questions in the field.

The scientific impact of advanced cyberinfrastructure deployed nationwide on all areas of scholarship could be much higher but real or perceived hurdles of accessing national resources limits the access to those resources, although all areas of scholarship are reliant to a growing extent upon advanced computing and data processing. However, the shortage of user training, as well as entry level and/or experimental and customised computational systems, to support the diverse requirements of the different research communities cannot be solely provided by national or campus solutions. Supporting a regional tier of computational systems will allow for experimentation and proof of concepts not suitable for larger national resources. These regional resources are also strategically positioned to integrate the

layers of the Branscomb pyramid into a coherent whole that scales dynamically to meet the needs of local PIs as well as national collaborations. Ready access to a pervasive, dynamic cyberinfrastructure (CI) remains an unmet need. In order to leverage the investment represented by distributed University resources, this CI must be integrated and shared effectively to promote the multi-institutional collaborations that drive modern science. Here again, regional organizations can play a critical role to catalyze both the trust required to share resources and the technology that is then necessary to implement this.

**Question 2** Cyberinfrastructure Needed to Address the Research Challenge(s) (maximum ~1200 words): Describe any limitations or absence of existing cyberinfrastructure, and/or specific technical advancements in cyberinfrastructure (e.g. advanced computing, data infrastructure, software infrastructure, applications, networking, cybersecurity), that must be addressed to accomplish the identified research challenge(s).

Many campuses have already taken numerous steps to address the growing demands from the science and engineering communities for regional and campus cyberinfrastructure. Strengthening those regional and campus by incentivising multi-institutional and regional sharing will provide a more diverse cyberinfrastructure in support of multidisciplinary scholarship. Leveraging the projects funded by the Campus Cyberinfrastructure grants to build distributed campus level environments that allow sharing of resources and contributing to Open Science Grid (OSG) resources and/or are a stepping stone to XSEDE resources; in the latter case enhancing the likelihood of proper utilization of national center capabilities.

Local and regional resources can be more responsive to local smaller user needs because they are closer to the community and have already developed trust with their user community. Generally, access to those smaller scale local and regional systems is easier because of simplified processes.

An additional advantage of regional resources would be that they could provide a much more diverse infrastructure that are different compared to current XSEDE level 1 providers and would be able to meet the needs of the many. It would also reduce the over requesting of national resource by providing resources to small and medium allocation requests that are currently supported by XSEDE level 1 providers. XSEDE would be well positioned to facilitate sharing between those regional as well as national resources.

**Question 3** Other considerations (maximum ~1200 words, optional): Any other relevant aspects, such as organization, process, learning and workforce development, access, and sustainability, that need to be addressed; or any other issues that NSF should consider.

Some universities already provide regional outreach within their state or region, but incentives for non-EPSCOR institutions to provide regional cyberinfrastructure leadership are low. These regional collaboration would be able to offer the economics of scale. Running one larger regional system can be managed more efficiently at one place with user support distributed over the partners of the regional system. The current format of the Major Research Instrumentation (MRI) program makes it difficult to fund regional CI resources because submissions from several institutions will be counted against the limits of a campus and all partners have to go through internal competitions.

NSF should study the impact on broadening access to computational resources of the recent announcement by the British Engineering and Physical Science Council to invest in regional Computing Centres of Excellence.

**Consent Statement**

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